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TITLE: Producing liquid hydrocarbons from natural gas

Summary of Invention Paragraph (25):

[0022] Increased hydrocarbon product yields and reduced oxygen consumption improvements are obtained in a Fischer-Tropsch (FT) gas-to-liquids conversion apparatus by the use of additional apparatus to selectively recycle hydrogen, carbon dioxide and/or tail gas from the FT reactor. The apparatus has a first unit which is a synthesis gas production reactor for producing synthesis gas from a natural gas feedstock. Examples of such reactors are a partial oxidation (POX) reactor or an autothermal reactor (ATR). The second unit is a synthesis gas conversion apparatus which is the FT reactor. The FT reactor can have a catalyst exhibiting either a low water gas shift (WGS) activity such as cobalt or a high water gas shift (WGS) activity such as iron. The improved results are obtained by using a hydrogen gas separating and recycling system for separating the hydrogen from the tail gas exiting the FT reactor and recycling at least a portion of the separated hydrogen back to the inlet of the FT reactor or the synthesis gas production reactor. In addition, depending on the nature of the oxidizing gas used in the synthesis gas production reactor, the nature of the catalyst in the FT reactor, and whether a POX or ATR unit is employed, (1) a tail gas recycling system may be employed for recycling at least a portion of the remaining tail gas, either before or after the hydrogen has been removed, to the inlet of the synthesis gas production reactor or (2) a carbon dioxide gas separating and recycling system may be employed for separating the carbon dioxide from the tail gas exiting from the FT reactor and recycling at least a portion of the carbon dioxide to the inlet of the synthesis gas production reactor.

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